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UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

PRELIMINARY INVESTIGATION REPORT

EAST FORK DUCK CREEK WATERSHED

Noble and Washington Counties, Ohio

January, 1968

U. S. DEPT. OF AGRICULTURE
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SEP 28 1968

C & R-PREP.

GENERAL INFORMATION

The East Fork of Duck Creek Watershed is a long, north-south feather shaped area of 181 square miles, or 115,800 acres. It extends from Noble County south to Marietta on the Ohio River in Washington County. Of the total drainage area about 67,000 acres occur in Noble County, 43,000 acres in Washington County, while 5,800 acres on the eastern side of the watershed extends into Monroe County. This watershed includes the East Fork of Duck Creek and Duck Creek which is formed by the union of East Fork and West Fork.

The villages of Whipple, Lower Salem, Harriettsville, Stanhopeville, Carlisle, and East Union are largely within the valley of the main stem along with Middleburg on the Middle Fork tributary. Several other small villages are located in the upland areas of the watershed.

U. S. Route 21 follows Duck Creek main stem for several miles near Whipple and East Fork Duck Creek main stem at Lower Salem. U. S. Alternate Route 50 follows the Ohio River in the vicinity of Marietta crosses Duck Creek at its outlet. State Routes 78, 143, 260, 364, 365 and 724 also traverse the watershed.

The new Interstate 77 which is expected to replace U. S. 21 is under construction in upland areas of this watershed.

The Pennsylvania Railroad Company operates a line along Duck Creek main stem.

The topography of the area is moderately steep, and can be considered that of a mature plateau, with numerous hills and valleys. The maximum difference in elevation between the upland in Noble County and the flood plain in Marietta is 650 feet. The stream pattern is dendritic and rock controlled with Duck Creek forming the

main stream, and East Fork, Middle Fork and Sycamore Creek as largest tributaries.

The watershed lies in the unglaciated Allegheny Province. Bedrock in irregular exposures is equally divided between the older Pennsylvanian Monongahela Formation and younger Permian Dunkard Group. Both rock groups consist of sandstones, shales, and coal. Coal is important economically in the Monongahela, but only scattered strip mining is carried out in the Dunkard. Gas and oil have been recovered from older rocks within the Watershed.

Soils in the area are those of the residual sandstone and shale region of Ohio. The Muskingum-Upshur soils are found on the hills and slopes, and Huntington-Lindsdale-Wheeling in the bottomlands.

About 22% of the watershed is in cropland; 42% in pastures; 22% in woodland; and 14% in other uses. A portion of the "other" uses is in strip mined land.

General type farming prevails with a considerable portion of the flood plain being used for crop production. Corn, grain, and meadow are the principal crops grown. The sale of livestock and livestock products makes up the primary source of agricultural income.

Timbering, gas and oil, coal mining and related processing and transportation are the major industries other than agriculture in the area.

WATERSHED PROBLEMS

Frequent flooding, causing damage to agricultural land, crops, roads, bridges, railroads, and villages, is the major problem in the East Fork of Duck Creek Watershed. The small villages of Lenoir, Salem, Harriettaville, Carlisle, and East Union experienced extensive losses from recent floods of 1961, 1963, and 1965. Parts of these villages were swept away by early floods and have not been rebuilt. A child's life was lost in an early flood near East Union when a car became stalled in high water. Several others were nearly lost in more recent instances. Roads and railroads are frequently closed due to highwater and damaged roadbeds and bridges. Damages to 21 miles of roads and 6 miles of railroad were evaluated. Replacement cost savings are expected to accrue on 17 bridges.

An estimated 3,600 acres are subjected to flooding, sometimes more often than once each year. The flooded area was determined by recheses using high water marks, survey data, U.S.G.S. topo-

graphic maps, field observations and interviews.

Existing channel capacities were derived using 41 channel cross sections surveyed during the Preliminary Investigation studies.

Average annual crop and pasture damages were determined by estimating values by months, by crops, and related frequency of flooding. Other agricultural damages and indirect damages were based on estimates resulting from interviews and observations compared with data from similar watersheds. Transportation and urban damages were estimated from data secured through correspondence with officials, interview, and projection of reliable information from other watersheds.

Summary of Annual Floodwater Damages Evaluated

Crop and Pasture	\$ 38,401
Other Agricultural	4,812
Roads, Bridges and Railroads	32,157
Urban	5,168
<u>Indirect</u>	<u>9,947</u>
Total	\$ 90,685

Floodwater damages to urban facilities evaluated for the 1963 flood in the several villages amounted to \$28,377. This damage occurred to 22 small businesses and public buildings and to 31 homes. Most of the businesses occur in Lower Salem. Curtailed services were not evaluated.

The villages of Lower Salem and Whipple are acutely in need of more water of better quality. Current sources are local wells and hauling from the Marietta area. The proposed structure site near Lower Salem on Pawpaw Creek is well located to provide opportunity to help meet this need for water supply.

There is no sizeable water impoundment in the watershed available for recreation at the present time.

PROJECT OBJECTIVES

The primary objective in this watershed is to reduce floodwater damages to agricultural lands and crops, villages, and transportation facilities. Other objectives include: provision of water-based recreation; provision of municipal water supply; and control of erosion.

2.3.4.2.2.2. Lower Salem

A field reconnaissance revealed early that considerable floodwater damage was experienced frequently in the area. This finding was the basis for the decision to proceed with a regular preliminary investigation. During the detailed annual floodwater damage evaluation were estimated at \$20,000. Potential benefits in the form of bridge savings and agricultural and rural enhancement provide an additional \$25,000. These potential benefits combined with the \$90,400 floodwater damage amount to \$114,000.

The extent of floodwater damage reduction plus the potential benefits developed with project must equal or exceed the flood prevention costs of any proposed project. Land treatment consisting of strip cropping, critical area planting, hay and pasture planting and renovation, grassed waterways, diversion, tile drainage, farm ponds, and tree planting was considered pertinent with any combination of structures. The going program of the local Soil and Water Conservation Districts at the time of flood application preparations has 245 members. This cooperation will 50 percent of the estimated under 200 acrements. On farm and related costs is accomplished the needed land treatment measures are estimated at \$135,000 with associated technical assistance of \$15,535 for a total land treatment cost of \$171,105.

Every imaginable combination of structures and channel improvement was considered toward gaining optimum damage reduction with minimum cost. The long and narrow shape of the watershed dictates difficulty in appreciably reducing damage downstream from Lower Salem.

Thirty four potential floodwater retaining sites were located for consideration. Two sites on Bear Fork above Lower Salem were included. After field examination and study of the hydrologic and economic factors involved, a system of structural measures consisting of 3 reservoirs and channel improvement was proposed. This system included a large reservoir near Elk which would require abandonment, or relocation, of State Route 260. Another large reservoir was proposed on Middle Fork a short distance from the main area of Duck Creek. This would necessitate the closing of State Route 554. All proposed channel work was located above these two sites. A favorable benefit-cost ratio was obtained only when no highway relocation costs were included as project costs.

This proposal was not acceptable to the local sponsors since the local city/county was reluctant to abandon S. R. 260, and highway officials have no plans for relocating it. Therefore, highway costs would have to be included as project costs, causing the

could be owned benefits from flood reduction.

After review with sponsors in August 1960, it was agreed that the most effective program will be a combined flood control and flood reduction system with a flood control dam on Middle Fork and a flood reduction dam on the main stem. The balance of this report pertains to the flood reduction plan.

Structural Features

Because of important interrelationship existing in the matters of major tributaries and the main stem, it was necessary to design an effective flood reduction system affecting primarily at least one major tributary. The process then was to determine which interrelationship could be least costly without sacrificing effectiveness.

Summer study indicated that when a specific flood water control structure was located on the main stem, just E. of the village, results open. However, one dam was needed on Middle Fork which would require relocation of State Route 125, a rather costly project. Another large after-dam structure, being retained from the earlier proposal, there also was on Middle Fork and Pampa Creek tributaries. The latter site could be developed with up to 100 acres of permanent water. This water, adequately back the area would be used for recreation and water supply. Cost estimates were based on a study of U.S.G.S. topographic maps, field observation, and detailed cost estimates from similar projects. Sediment storage estimates were based on existing reservoir survey data from similar reservoirs only. A longer survey (about

Number of sites	2
Total drainage area controlled	72,812 sq. mi.
Percent of total watershed controlled	49 %
Estimated sediment storage	8,720 Ac. ft.
Estimated floodwater storage	16,185 Ac. ft.

No channel improvement is included in this system although the cost of such work on Middle Fork tributary, between Park Gap Reservoir and the Village of Middleburg, would probably be offset by benefits. Such channel work could extend into the 100-year flood pool area of the Middle Fork structure.

This combination of structures cost a total of \$5,347,770 of which \$1,171,310 would be PL-566 costs. Flood costs estimated at \$1,550,000 account for 75% of the \$2,175,000 portion that PL-566 covers, excluding land treatment.

The annual installation cost for structural measures amounts to

\$115,100 while operations and maintenance costs to be borne by other than PL-906 funds are estimated at \$7,125, making a total annual cost of \$115,825.

Benefits from flood reduction were estimated to be the difference between existing damages and remaining damages with the project. Benefits evaluated totaled \$111,500. Of this total \$9,100,000 are flood reduction benefits. Recreation, environmental, and economic benefits make up the balance. Subject benefits were estimated as 10% of the direct benefits to agriculture and 10% of direct benefits to roads, railroads, and houses.

The benefit-cost ratio for flood reduction was determined using average benefits of \$100,000. With fixed costs the benefit-cost ratio becomes slightly more than 1:1. With costs which are total costs (operating), the benefit-cost ratio is a fraction of 1:1.

The attached tables were prepared for presentation to project sponsors. Any details not specified but likely to be known from data at governmental local facilities and state or operating agencies are not reflected in the tables. Each table lists all items such as 12. Costs from a state or governmental organization or agency. Damages were projected into categories indicated in this table. The Harcourt Creek figures used benefit estimates of \$10,000, less annual cost. Of this, \$5,000 was for annual facilities and \$5,000 for operations and maintenance.

CONCLUSIONS

In view of the unfavorable benefit-cost ratios for flood protection found in this study, no benefits considered were given and developed at this time. The level of protection provided by this project did not meet OCA standards throughout the flood area.

Sources of action which may justify modifications will be referred were discussed with local people. These possible actions include:

- A. Attempt to get affected roads abandoned, or abandoned with other funds, so that fixed costs will not be a project cost.
- B. Postpone further action until present PL-906 procedures are liberalized.
- C. Use most feasible portions of the best project alternative for consideration under Duckeye Hills Resource Conservation & Development Project. These portions likely are:

1. Lower Site alone will provide correct floodway for the village of Lower Solon, and protection of that village, recreation in adjacent parts of this site.
2. Papaw Site and Middle Fork Site together with major recreational development by the U. S. Forest Service of Fawnan. Include water supply considerations for Villages of Lower Solon, Warner, and Whipple.
3. Papaw Site alone as a multiple purpose flood prevention, recreation, and water supply site.

See the table attached which shows the comparison of benefits and costs separately for the more effective structure plan.

**Table 10.10 - 1968-69
Estimated Savings**

**Table 10.10
Estimated Savings**

Item	Estimated Savings
Agricultural	\$ 19,000
Road, Railroad, & Bridge Savings	27,725
Ferry	1,000
Ferry and Related	1,000
Other Savings	1,000
Subtotal	23,725
Total	42,725
Total	42,725
Total Benefits	\$143,970 ^{1/}

^{1/} Excluding lost treatment benefits not allocated any amount, assumed to equal or exceed costs.

January, 1968

EAST FORK BRICK CREEK WATERSHED
 2001-2002 FLOW DATA SUMMARY

2001-2002

(Units: cubic feet per second)

Watershed	FL-200 Cost	Other Than FL-200 Cost	Total
East Union	\$ 127,700	\$ 31,500	\$ 159,200
Greasy Run	153,800	69,300	223,100
Schwab Run	127,700	21,900	149,600
Road Fork	308,960	796,040	1,105,000
Middle Fork	300,400	1,006,900	1,307,300
Paw Paw Creek	104,100	230,400	334,500
Total	\$1,171,310	\$2,175,960	\$3,347,270

January, 1999

2021 FIVE YEAR FLOOD RISK ASSESSMENT
 (2021 Annual Budget Update)

Appendix 2B

2021-2025 FIVE YEAR COSTS

Item	LAND COSTS	ROAD COSTS	EST. % OF CONTRACTS	CONTRACT TICKET PRICE	TOTAL COST
Deer Creek					
Deer Creek	125,700	—	22,000	—	251,400
Grassy Run	66,000	—	2,000	—	132,000
Schwab Run	16,000	—	2,000	—	32,000
Red Fork	181,000	480,000	5,000	—	661,000
White Fork	120,000	300,000	4,000	—	420,000
Red Fox Creek	89,000	—	5,000	\$15,100	203,100
Total	\$453,200	\$1,200,000	120,400	\$15,100	\$1,668,300

January 2, 2021

EAST FORK BLACK CREEK WATERSHED
PRELIMINARY INVESTIGATION

Table 1. Cost

Item	Annual Installation Costs	Operation and Maintenance	Total Annual Costs
Costs	\$115,400	\$2,125	\$117,525

Estimated
Cost \$117,525

Excluding land treatment costs of \$5,707.

January, 1968

COMPARISON OF BENEFITS AND COSTS BY STRUCTURE FOR RESOURCE CONSERVATION & DEVELOPMENT PURPOSES

EAST FORK DUCK CREEK WATERSHED

(Dollars) 1/

Measure	Damage Reduction 2/	Average Annual Benefits				Total	Average Annual Cost	Benefit to Cost Ratio
		Enhancement Agr.	Urban	Recreation Planned	Recreation Incidentals	Redevelopment		
East Union and Channel	10,754	792	-	-	5,394	2,832	1,377	21,349
Greasy Run	5,629	461	-	-	3,285	1,223	714	11,312
Middle Fork	12,557	1,047	3,870	-	-	1,726	1,640	21,090
Panpan	7,030	953	3,870	60,760	-	2,207	7,433	82,293
							24	30,545
								2,181.0

1/ Price Base 1967 for Installation Costs and Adjusted Normalized for Benefits and QM Costs.

2/ Includes Bridge Savings.

3/ Includes \$25,224 for Installation plus QM of recreation facilities.

January, 1968



